...TY OF CONGRESS...

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Gas as Fuel.

Two of the three prime necessaries of civilized housekeeping, water and light, are now provided in our city homes without carriage. The third, fuel, is still subject to many troublesome and expensive handlings. Consider the cost of a poor man's fire, after the coal is paid for at the retail coal yard. The retailer's profit and the cartman's pay for delivering the coal in small lots being included in the purchase price, we will leave them out of the account—though the cost of distributing a year's supply of coal throughout a city like this is something enormous—and take up our dirty fuel from the pavement at the consumer's door, If there is a hole in the side walk through which the coal can be pitched to its place in the cellar, its conveyance thither is a matter of small moment; but the chances are that there is no such convenience. In this more common case, the coal must be shoveled into pails, buckets, or baskets, and toilsomely carried to its receiving bin, perhaps through a preliminary alley way of considerable length. This cannot be done without an expenditure of time and strength, having a measurable money value, which increases by so much the original cost of the coal. The fire is wanted on the third, fourth, or fifth floor. Some one must descend to the cellar, shovel up the coal, and bear it by hand up the intervening flights of stairs, putting forth, it may be more human effort than was required to lift the coal from its native bin in the mine. At the mine, coal lifts and carries coal · in our houses the work is done by human muscles. In the process of feeding the fire the coal is handled again; a small matter when we think only of one bucketful; but multiply it by the number of bucketsful handled every day in the city, and the product is an amount of labor not at all to be despised. While burning, the fire calls for constant attention; it must be watched, regulated and renewed, each step costing still more time and labor, the grand aggregate of which, for all the coal consumed, is very great. Then the ashes must be taken up, sifted and carried away, involving yet more cost of time and strength; and coals and ashes soil the hands, clothes, and furniture, which must be made clean again by additional labor. The burden of all this labor falls heaviest on the poor, for by them the coal is most frequently handled; but the rich are far from exempt. Could we sum up the cost of service employed in caring for our household grates and furnaces, the aggregate would swell immensely our yearly bills for fuel.

Further, the burning of coal in small quantities, as in cooking stoves and small heaters, is wasteful in the extreme. The combustion is imperfect; but a fraction of the possible heat is cooled; and much of that is wasted in cavernous chimneys. Then a large percentage of the coal is consumed when no heat is required, when it is objectionable even, to keep the fire in readiness for the time of need. In short there are a thousand ways in which the original cost of coal is augmented and its efficiency diminished in the common crude and unscientific use of it for household purposes; ways never suspected by those who have never used a fuel which has none of the drawbacks of coal; which burns cleanly, quickly, perfectly, and requires no carriage, namely, gas. It is more than probable that our children will live to look back upon our wasteful, troublesome, and expensive fires as we do upon old time tallow dips and the fetching of water in buckets from the town pump. Already the use of gas as fuel, especially for cooking, has been proved to be not merely convenient but economical; and economical in spite of the fact that the gas used has been expensively and, for fuel, needlessly refined, and paid for at an exorbitant rate even for illuminating gas. A cruder product would answer just as well. "Don't never prophesy unless you know," is the sound advice of one of our humorists. In the face of the caution, however, one may safely predict that the fuel of the future will carry itself, and will leave no soot or ashes. Further, the combustion will be perfect, and under perfect control; and however small the quantity burned in any case, its full heating power will be developed.

For several months a friend of ours has been testing the availability of gas for these purposes. He has used a range having two separate burners for boiling or frying, and a third burner heating at once a roasting chamber (on the principle of a Dutch oven) and an ordinary closed oven for baking. Broiling is done in the roasting chamber under a sheet of flame which covers uniformly the top of the chamber. The range has ample capacity for a family of six or eight persons, though in the present case the cooking was rarely for more than two, living modestly yet fully up to the average of people in moderate circumstances, and having two meals always, generally three meals, a day. Biscuits were baked occasionally but not bread, which, however, was almost always toasted in the roasting chamber under a full sheet of flame. During the three months just past the gas consumed—measured by a standard meter officially sealed—amounted to a trifle short of 1000 feet, costing even at the high rate charged by our metropolitan gas companies, two dollars and a half, and averaging not more than one cent a meal. Had coal been used for the same cooking, it would have cost more to hire a boy to fetch it from the cellar and carry away the ashes.

The secret of the economical cooking can be told in few words. There was no fuel wasted. Its full heating power was scientifically developed, where it was wanted, and just so much as was wanted, and no more. There was no waiting half an hour for the fire to kindle and heat up the stove? there was no high degree of heat maintained when a lower degree would suffice; and the instant any portion of the heat was no longer required, that moment generally speaking, the flow of gas was stopped. Was a certain temperature required at a given point for ten minutes, half an hour, or any other interval, the gage could be set to maintain it uniformly and trustily. It was certain the fire would not get too hot, or go out, or vary in the least. This divested the cooking of half its trouble and nine tenths of its anxiety; and there was no food spoiled by accidental causes. It is true that such economical cooking involves more than ordinary care, intelligence, foresight and conscientiousness on the part of the cook, still it is not more than the majority of women are capable of; and when cooking is thus made light, cleanly, and free from uncertainty and worry, there will be less repugnance on the part of well to-do wives to this most important domestic duty.

If costly illuminating gas can be used economically for fuel, there can be no question of the feasibility of warming our rooms and cooking our food with gas less highly refined and consequently much cheaper.—*Scientific American.*

Glycerine to Prevent Boiler Incrustation.

At the last meeting of the Society of Civil Engineers, Mr. Asselin recommended the use of glycerine to prevent boiler incrustations. The theory is that glycerine, soluble in water in every proportion, increases the solubility of combinations of lime, and especially of the sulphate; it appears, beside, to form with these combinations soluble compounds. When the quantity of lime becomes so great that it can no longer be dissolved, nor form with the glycerine soluble combinations, it is deposited in a gelatinous substance, which never adheres to the surface of the iron plates. Moreover, the gelatinous substances thus formed are not carried with the steam into the cylinder of the engine.

Mr. Asselin advises the employment of one pound of glycerine for every 300 or 400 lbs. of coal burned. This rule is by no means absolute, and must be corrected by experiment. But it appears reasonable to proportion the quantity of anti-incrustating fluid to the fuel consumed, and not to the power developed, or the area of heating surfaces. The glycerine is placed into the boilers in such a quantity, that sufficient for fifteen days' supply is introduced at a time. From trials made with boilers fed with bad water, it was proved that the glycerine combined with all the salts, and left the plates perfectly clean. The objection has been raised against this mode that the glycerine may produce priming, but this objection has not been proved valid, and M. Asselin replies that insoluble bodies can only produce such an effect, and that it is not to be feared with glycerine.—*Iron.*

A statue of Gen. Putnam is being cast at Phila., Pa.

Chemical Repertory.

No. 100.—October 2, 1873.

EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

862. Gasoline Fire in France.—The European journals give the following account of a fire in Paris on the 31st of July:

"A fire, attended with most disastrous consequences, took place at Reueil. A man in the employment of a grocer was about to draw some mineral essence (gasoline) from a small reservoir containing over 20 gallons, in the rear of the shop, when the vapor reached a lighted candle placed at a distance. In a moment the place was in a blaze, and the man rushed out with his clothes on fire. Those flames were extinguished and the local firemen soon extinguished the conflagration by throwing flour and water, which formed a paste on the liquid spilt on the ground. No great harm was done so far, but the deputy mayor insisted on going into the cellars, in spite of the warnings given to him. He went down in safety, accompanied by an officer of the firemen; but in returning the vapor of the gasoline took fire, and communicated to the reservoir, which burst with a loud explosion, blew out the shop window, and scattered the burning fluid over the crowd assembled in the street outside. Nearly fifty persons were burnt, and ten are lying in a critical condition, among them a lieutenant-colonel and several soldiers, who were rendering assistance; the remainder are firemen and inhabitants of the town."—*Manf. and Builder.*

863. Crampton's Coal-Dust Furnace.—The recent trials of Crampton's new furnace at Woolwich—a furnace wherein coal dust is successfully burnt—is a notable example of the utilisation of old facts. The principle of the invention is to blow a mixture of finely powdered coal and air into a fire, whereby a powerful combustion is effected. The lecture-room analogue of this is an experiment of Faraday's in which he shook up a jar of dry oxygen with charcoal dust, and while the particles of carbon were still in suspension, applied a light, when the whole jar became a source of intense light and heat, owing to the rapid combustion which ensued. Thus the plaything of one age becomes the tool of the next, and isolated scientific facts are the germs of gigantic industries.—*Iron.*

864. Increasing Temperature of the Earth.—When Alexander von Humboldt wrote the "Cosmos," the deepest known bore-hole was that of Oeynhausen, near Minden, in Westphalia, reaching to a depth of 2,220 ft. Rhenish, or 2,284 ft. English. Since October, 1872, however, the great bore hole, which was sunk through rock-salt at the village of Sperenberg, near Berlin, has reached the considerable depth of 4,052 ft. Rhenish, or 4,169 feet English, undoubtedly the greatest depth which has ever yet been attained. This bore-hole was used for making observations on the temperature of the earth's crust, and Oberbergrath Dunker, of Halle, has recently published a pamphlet on the results obtained. For these observations Walferdin's ordinary maximum thermometer could not be used, but the so-called gas-thermometer of Magnus was substituted for it. The temperature obtained was at

Rhenish ft.	English ft.	Fahr. deg.
100	102.9	52.7
1000	1029	73.8
2000	2058	91.4
3000	3087	109.4
4042	4159	118.6

With respect to these results the author remarks, that in this bore-hole, which is filled with water, regard must be taken to the circulation of the latter, as the warmer water at the bottom, having the least specific gravity, has a tendency to rise, and the upper strata an opposite tendency to sink to the bottom, consequently, when measuring temperatures in very deep bore-holes, the index of the thermometer must show somewhat too high near the surface, and somewhat too low at the bottom for the actual temperature of the rock.—*Eng. and Ming. Jour.*

865. Development of the Bituminous Coal Trade.—A correspondent of the *World* writes as follows from Port Richmond:

Within the last six months the demand for semi-bituminous coal has largely increased, and orders are pouring in from not only southern ports, but from the West Indies, and even the East Indies and coaling stations in the Pacific. The direct cause for this increased supply is entirely owing to the rise of the price of coal in England, and from the advance of rates. London and Liverpool shipping houses and steamship companies are transmitting their orders to America for coal to supply their coaling stations in the South Pacific and the West Indies, and the tendency of the trade in this direction points strongly to the conclusion that Pennsylvania semi-bituminous is a much better article for steamship fuel than Newcastle coal. An immense business is doing here, and so great is the increased demand for coal that enough vessels cannot be obtained for conveyance. Rates have advanced considerably during the last few weeks, and the freight to Boston to-day is $2·75 per ton.

One company now has sixteen screw colliers running regularly between Philadelphia and New Orleans, Savannah, Halifax, and Havana, carrying 500 tons each, and the fleet will be increased as fast as the ship yards can build the boats.—*Iron Age.*

866. Quicksilver at the Vienna Exposition.—In the pavilion of the Ministry of Agriculture, erected on the Exhibition Place, which contains highly interesting collections, a floating cannon ball may be seen. Although weighing 50 lbs. it lies like a down feather on a splendid silvery mass, consisting of pure quicksilver from the celebrated mines of Idria. 150 cwt. of this metal is exhibited in a large iron caldron, offering a sight seldom to be met with, and on it rests the solid iron ball. It was interesting to observe the emptying of the quicksilver into its receptacle. The metal is very cleverly stowed away in bags of white sheep leather, specially prepared for the purpose, each containing 50 lbs. of the mass, the bags being tightly bound round the top, and then put into small wooden barrels, carefully bunged up. Formerly, this liquid metal, which penetrates easily all porous substances, was transmitted in wrought-iron bottles of very expensive make. A gentleman, in testing the resistance of the metal, had to use some force in inserting his hand into the mass; but how great was his surprise when, withdrawing his hand, he found that two gold rings he wore had been changed to silver!—*Iron.*

867. Carbonic Acid in the Air.—Sir Walter Trevelyan, in a communication recently addressed to the *Gardener's Chronicle*, starts a curious and ingenious theory on the advantage of a small percentage of carbonic acid in the air. The sedative nature of this gas is well known, and with most animals in a state of nature, sleep comes on at the time when plants commence to develop carbonic acid, that is, at sunset—and it relaxes its hold about sunrise, when plants begin to exhale oxygen. Further, when men and animals compose themselves to sleep, they not only do so in the position which gives the greatest relaxation to the muscles, but they "place the head so as to favor the accumulation of that gas about it, and consequently its inhalation. The head of a man, when at rest, generally lies low, on a soft and depressed pillow, those of most quadrupeds couched between their paws, and those of birds nestled among the feathers of their backs or wings." so that in all these cases, owing to the low and confined position of the mouth and nostrils, much of the air must be inhaled again and again, and become gradually mixed with a larger proportion of carbonic acid. He also adduces the fact that the carnivora, who are nocturnal in their habits, retire during the day to deep and narrow caverns, in which the air becoming vitiated by their respiration, tends to promote sleep. The obvious objection to this theory is, that the carbonic acid becomes rapidly diffused, so that the air in every part of the room would probably be found to be sensibly of the same composition.

868. Nova Scotia Coal Trade.—In the following tables there is a comparison for the first six months of the present year of the Nova Scotia coal trade with the same period of last year:

	Tons.
Coal raised in 1873	455,560
" " 1872	272,060
Increase	183,500
Coal sold in 1873	226,700
" " 1872	157,100
Increase	69,600

869. A Chemical Experiment.—To prove that the inner, dark portion of an illuminating flame contains combustible gases, the general practice with experimenters is to insert into that part of the flame a glass tube, so inclined that a portion of these gases shall rise into it, and thereupon igniting them at the farther extremity of the tube, or leading the contents of the tube by an aspirator into a convenient vessel, when its combustibility can then be directly tested. Mr. Heuman has communicated to the German Chemical Society another method, and a simpler one, of accomplishing the result, which seems worthy of notice.

He recommends taking advantage of the well-known fact that a mixture of about four parts of chlorate of potassa and one part of strontium nitrate, heated to fusion, will burn with a very intense flame in hydrogen or illuminating gas, when once the ignition of the oxygen liberated from this mixture is effected by contact with a flame.

To perform this very pretty experiment, the author states that it is only necessary to fuse a small quantity of the mixture in question in a little spoon at the apex of a luminous gas flame, and then to lower it into the dark portion, when a brilliant combustion will immediately ensue; while, when removed to the luminous portion of the flame, or taken altogether out of it, is at once extinguished.—*Jour of the Franklin Inst.*

870. How to Test the Richness of Milk.—Procure any long glass vessel—a cologne bottle or long vial. Take a narrow strip of paper, just the length from the neck to the bottom of the vial, and mark it off with one hundred lines, at equal distances, or, if more convenient, and to obtain greater exactness, into fifty lines, and count each as two—and paste it upon the vial, so as to divide its length into a hundred equal parts. Fill it to the highest mark with milk fresh from the cow, and allow it to stand in a perpendicular position twenty-four hours. The number of spaces occupied by the cream will give you its exact percentage in the milk without any guess work.—*Miss. Agriculturist.*

871. Sir Charles Wheatstone has been electep Foreign Associate of the French Academy of Sciences, to fill the vacancy occasioned by the death of Baron Liebig, and Mr. Gladstone has been elected a member of the Hungarian Academy of Science.—*Min. and Sci. Press.*

872. Medical Uses of Charcoal.—A lecture was recently delivered before the Society of Arts, in London, by Mr. W. E. Newton, in which he attributed various virtues to peat and other vegetable charcoal. He stated that in the form of powder, put upon poultices, peat charcoal had been most beneficially employed in some of the London hospitals, especially in cases of offensive sores. It absorbs the putrid effluvia, and was of great benefit in cancers, etc. In many cases, when taken internally, it was productive of good effects in those troubled with disordered stomachs, such as heartburn, sick headache, palpitation of

the heart, and giddiness. In all diseases of the chest, sore throats, diphtheria, or bronchial affections, peat charcoal has been found very useful. In France a scientific commission appointed by the government to investigate this subject has reported very favorably in regard to the usefulness of this substance for a great number of purposes. A minute quantity of peat char coal, in powder, boiled with some American cornstarch and milk, has been given with almost miraculous success in London for curing dysentery.—*Coal and Iron Record.*

873. Remarkable Pumping Apparatus.—The largest pumping apparatus in the world is that recently constructed in England for draining the Ferrara marshes. The total capacity is 456,000 gallons discharged per minute, at a mean lift of 7 feet 3 inches.

874. The Tunnel at St. Louis.—The great railroad tunnel in St. Louis is progressing rapidly, and in a very satisfactory manner. The following figures in regard to the work will be of interest:

The span of the arches of the tunnel, of which there are two, is 14 feet clear, and the height 17 feet. The arches have a depth of five lengths of brick springing from a wall of solid stone, whose foundation is six feet thick; the side walls are five feet thick to the spring line, above which the thickness of the wall is four feet; the centre wall is three feet in thickness. All the brickwork and masonry is set in hydraulic cement. Ten barge loads of Grafton stone are consumed weekly and 40,000 brick each day. The various labors connected with the construction of the tunnel give employment to not less than 1,500 men and over 200 teams. To assist Capt. Eads in the engineer department are the following:

One superintending engineer, five assistant engineers, six inspectors of masonry and one draughtsman, all gentlemen of experience.

875. A Large Casting.—The largest casting ever made in Harrisburg was turned out lately at the foundry of the Harrisburg Car Company. The casting is 30 feet long, 2 inches thick and 8 feet wide, weighs about 14 tons, and is intended as a bed-plate for the engine being constructed at the machine works for the new water works.

San Antonio Gas Company.

We take the following interesting description of the above works from the columns of the San Antonio, Texas, *Daily Herald*. It was furnished that paper by Sylvester Watts, Esq., the Engineer and Builder:

Herewith please find some items in regard to the San Antonio Gas Company and gas works. In the month of February, 1872, I purchased nearly one half of the stock of the company and entered into an agreement to furnish all the necessary machinery and material, and rebuild the works. The construction of the material was so delayed that it did not arrive at Victoria until December and January last. The heavy rates of freight at that time prevented the company from having it brought here until April, since which time a number of delays, incident to being without railroad communications, have retarded our operations. To allay the doubts of those who imagine that the gas will not be steadily supplied, I will say that I have constructed works at Atchison, Kansas, St. Charles, Mo., Louisiana, Mo., and Boonville, Mo., which are now, and have been since their construction, kept in constant operation. And further that our works here are so constructed that they will admit of the economical use of either coal, rosin, bones, cottonseed, mesquit wood, or the bituminous shale which is found at the head of the San Antonio river.

On my arrival here to commence work in February 1873, I erected a small test-work, large enough to try three lbs. of coal at one charge.

With this apparatus I tested the lignite coal from the Atascosa, Cibolo and Nueces.

The Atascosa yields five feet to one pound, the Cibolo four feet, and Nueces four feet. These like all lignites yield but a small proportion of carbon, therefore they are not valuable for making illuminating gas. The large amount of hydrogen which they contain adds much to their value as fuel, or for making heating or fuel gas.

Bones yield two feet to the lb. of very good gas. The residuum, bone black, is worth 3½ to 4 cents per lb. in New York.

Mesquit wood yields four feet of gas of about 25 per cent. better quality than the lignite. For the residue, charcoal we can find a ready market here at home, for all we could make, as it is far superior in quality to to that burnt in kilns.

The bituminous shale yields after having been exposed to the action of the atmosphere for months, one and one-half feet per lb. This shale has been found after heavy rains on the lands of Messrs. McLean and Breckenridge, having been washed down by the San Antonio.

Making gas from any of the above material except the lignite requires (in comparison to making gas from coal) a very small amount of fuel. The mesquit or oak, or the charcoal from mesquit, will all serve for heating the retorts. The cotton seed yields 5 feet per lb. of as good gas as is is furnished at New Orleans or Galveston.

When fodder of all kinds is so cheap as at present, cotton seed can be had there for the expense of hauling, as there is no other demand than for feeding and for supplying one small oil mill at New Braunfels. After the oil has been pressed from the seed, the cake will yield four feet to one lb.

The cotton seed from within fifty miles of our city would make sufficient gas for a city of 100,000 inhabitants.

You can state Messrs. Editors, without fear of contradiction, that the San Antonio Gas Company can and will supply its customers for all time with a good article of illuminating gas.

The price charged $7 per 1,000 cubic feet, is the same as is charged in Houston and Galveston

The towns in Missouri and Kansas pay from five to six dollars per 1,000 cubic feet. This city and citizens will consume, including all lights, about 5,000 cubic feet per night for the next six months. This will gradually increase to about 10,000 cubic feet per night—without any addition to the population or business of the city.

As cities increase in importance the consumption of gas increases in a larger proportion, than the increase of population. For instance, cities of from five to ten thousand inhabitants will use about one foot of gas per night to each inhabitant, and cities of from twenty to thirty thousand population will use from two to four feet for each inhabitant. The consumption in Galveston is as high in winter months as 80,000 cubic feet per night.

The principal expense in manufacturing gas in small cities is the labor and superintendence and interest on capital. With the same labor and capital we can manufacture 20,000 cubic feet per day, or four times as much gas as we can sell in the next six months. The full capacity of the works is for supplying between twenty-five and thirty thousand cubic feet per day.

The works consists of two benches or furnaces of three retorts each. Only one of these furnaces and three retorts will be used until the consumption exceeds 20,000 cubic feet nightly.

A record of all gas made is kept, and, when compared with the amount registered by the city lamp meters and private consumers' metres, the exact loss by leakage can be ascertained, and, if in excess of 15 per cent., (the usual amount of leakage) the Superintendent will know that there are leaks which require his attention.

The old gasometer has been replaced by a new one of 48 feet in diameter and 15 feet in height, with six cast iron columns and girders; capacity, 24,000 cubic feet.

There are about three miles of main pipe, varying from six inches to two inches in diameter. Fifty-four private consumers and fifty-six street lamps. The main pipes are on Houston, Flores, Commerce, Presidio, Ascequia, Soledad, Alamo and Market streets, and Alamo and Main Plazas.

The lights throughout the city were very good for the first night. The residence of Mr. F Groos presented a magnificent appearance about 9 o'clock—also the residence of Maj. Kampmann.

The Company has not as many resident consumers as it should have, in proportion to the amount of main pipe laid.

We propose to furnish the very best light; and we purchase all our material in our immediate vicinity, and retain in the community the thousands of dollars that are annually sent to the East for kerosene oil. The fact that such a large amount of gas is used in Houston and Galveston (the former 38,000 and the latter 80,000 cubic feet daily) at the same price as is charged by the San Antonio Gas Company, fully demonstrates the fact of its economy. Kerosene can be had for 25 cents less at either of the above named places than in our city.

Proposed Substitute for Coal Gas.

We have recently had an opportunity of inspecting, in company with some sixty gentlemen interested in gas manufacture, the new process which is now being advertised so largely by a company which bears the title of "The New Gas Company, Limited." The works are on the premises of the Southwark and Vauxhall Water Company, at Battersea, and are well adapted for experiments upon a somewhat large scale.

The new company proposes to purchase the patents of Mr. W. D. Ruck, which appear to have culminated in the process we are about to describe. Everything was explained to us with great courtesy, and although there were some points of imperfection in the experiments we witnessed, the trial was upon the whole a fair one so far as it went.

The apparatus consists of three iron gas retorts set in a single furnace, one over the other two. Close above the retorts, and heated to bright redness by the same fire, is a horizontal U-shaped iron pipe, about four inches in diameter. The retorts are charged with a mixture of coke and iron, and steam from an ordinary boiler is then forced through the iron pipe, which it is obvious acts as a superheater. The superheated steam passes into the two lower retorts, being carried by pipes arranged in their axes to the further end, and then returning the mass of heated coke and iron. It then traverses the third retort in the same manner, and in this way a large volume of gas is generated, which is cooled in a temporary condenser and carried to a gas-holder. It is then purified in the ordinary way.

The gas so obtained has of course no illuminating, though a very considerable heating value. It is, in fact, a mixture of hydrogen, carbonic oxide, and carbonic acid, the latter amounting, it is said, to about 12 per cent. To render it luminiferous, it is passed through a chamber containing rectified petroleum spirit of specific gravity, 0·68. Of course a considerable quantity of the vapor of this spirit is taken up, and the volume of the gas is increased, it is said, by about 25 per cent. The gas then burns with a brilliant flame, and is ready for distribution.

In regard to the merits of this scheme, it must be remarked, in the first place, that it does not present any points of absolute novelty. The decomposition of steam by red-hot carbon was correctly described by Clement and Desormes in 1809, and is familiar to all chemists. In 1839, Bunsen published an analysis of the gases produced; they consisted, in round numbers, under the circumstances of his experiment, of—Hydrogen, 56; carbonic oxide, 29; and carbonic acid 15. The process, in one form or other, has been the subject of numerous patents. The reaction can be explained by one of two formulæ, according as carbonic oxide or carbonic acid is produced:

$$(1). \quad H_2O \times C \times H_2 + OO.$$

$$(2). \quad 2H_2O + C = 2H_2 + CO_2.$$

In (1) the volumes of hydrogen and carbonic oxide formed are equal, and one ton of pure carbon should yield 2·5 tons of the mixed gases, they jointly having a sp. gr. of 0·519 (at standard pressure and temperature) and a volume of 133·459 cubic feet. If reaction (2) took place alone, two volumes of hydrogen to one

of carbonic acid would be obtained. One ton of pure carbon would then yield four tons of the mixed gases, they having a sp. gr. of 0·554 and a total volume of 200·337 cubic feet. The volume obtained in either case would, of course, be somewhat greater at the ordinary temperature of the air. In practice, the two reactions take place, as chemical reactions so often do, side by side. The gas obtained by Bunsen must, at standard pressure and temperature, have possessed a sp. gr. of about 0·548.

The carburetting process is scarcely more novel. Of late years, methods for increasing the illuminating power of gas, by introducing the vapor of hydrocarbons, have been tried again and again, and a flourishing rival to the new company is now trying to introduce the use of a gas made by passing common air through a similar petroleum spirit.

It must not be supposed, from the foregoing remarks, that we intend to assert the invalidity of Mr. Ruck's patents. We do not pretend to form any opinion upon this point. It often happens that a patent is perfectly sound, even when it embodies no original idea, some modification in the physical conditions constituting in the eye of the law a sufficient novelty to justify protection. Indeed, some such modification is often all that is necessary to convert a worthless into a highly valuable process. This was the case notoriously with the celebrated paraffine oil patent.

One of the greatest questions in regard to the new gas is whether and how far its illuminating power will stand the test of cold. The vapor introduced is, after all, a vapor, and as such capable of more or less complete condensation. Would any such condensation occur during cold weather, and if so, would its amount be sufficient to impair in any serious degree the value of the gas? It is well known that many carburetting schemes have failed from this cause, and although it may be that so light a spirit has not been employed before, the point is one that ought to be most clearly made out. The scientific advisers of the new company assure us that they have tried the experiment of cooling, and also of storing the gas, without injuring its quality, but we confess we should like more complete and definite evidence in support of their assertion. The day upon which we saw the experiment was a very cold one, and more than 1000 yards of 3-inch main, all ready fitted, lay outside the building, having, we are told, been previously used for just such a trial. Why was not the gas passed through it? The experiment would have been peculiarly convincing on such a cold day, especially if the gas had been suffered to remain for 24 hours in the main.

The question whether or not the vapor will condense in material quantity in cold weather could only be answered by a knowledge of its tension at low temperatures. Upon this point we have no evidence before us, and are therefore unable to express an opinion.

Some doubt also hangs over another matter. The printed reports of the company assert the superiority of its gas over the air-gas, because the latter, having about the same specific gravity as air, requires so much force to drive it through the pipes. And yet they do not tell us the specific gravity of their own. If it be true that it contains 28 per cent of the vapor of liquid hydrocarbons, it is difficult to understand how the specific gravity can be much less than that of common air. Hexane, for instance, $C_6 H_{14}$, one of the largest constituents of petroleum spirit, has, at standard pressure and temperature, a vapor density very nearly three times that of the atmosphere.

The new process claims to effect a great saving in regard to expense. One ton of coal by the old process yields, in round numbers, 10,000 cubic feet of gas; whereas by the new, one ton of coke should yield from 130,000 to 150,000 cubic feet, or possibly even more. The result is stated in the prospectus to be that the labor of twenty-nine out of every thirty men will be saved. In another part of the same prospectus, we are, however, told that the saving of labor will be "to the extent of 50 per cent," so that there appears some ambiguity in the matter. Messrs. Quick and Son, the engineers, report, as the result of their experiments and calculations, that "gas of 16½ candle-power may be manufactured at a cost of 1s. 7d. per thousand cubic feet." Such a consummation is devoutly to be wished, but its realization must obviously depend upon a somewhat complex set of conditions. The managers of the undertaking do not hope, we understand, to get their processes adopted in large English towns, for the present at any rate. Probably they are wise, for if they did they would at once be met with the difficulty. Where is the necessary coke to come from if the old mode of gas-making be abandoned? Charcoal, or even wood, would hardly be proposed as a substitute in this country. In many foreign countries the case is very different, and it certainly appears possible, or even perhaps probable, that in places where wood is cheap and coal very dear, this process, or some slight modification of it, may be adopted with advantage.

One of our contemporaries, animadverting somewhat severely upon the new process, exclaims against the idea of introducing so deadly a poison as carbonic oxide into our houses. The point is one of great importance. It is true that ordinary coal-gas contains this poison to the extent of some 5 or 6 per cent. It is also true that carbonic oxide is completely converted into the comparatively harmless carbonic acid when burned, but there is some difference after all between 5 or 6 per cent and 29, and the risk of an escape of gas would be materially increased by the presence in it of so large a quantity of such a deadly ingredient.

Here, again, we require more information, but we must admit that we hardly think it likely that the terrific results dreaded by our contemporary would be verified even if the new gas were introduced. Surely it is an exaggeration to say that "an escape of this gas, such as takes place in many houses every day with coal-gas, would be certain death to every one of the inhabitants."

In conclusion, we will remark that, although it has been our duty to present to our readers the chief doubts that beset us in regard to the new scheme, we are far from thinking it absurd or unworthy of trial; on the contrary, we would fain hope that under certain circumstances it may prove a valuable addition to our means of comfort.—*Chem. News.*

More Light.

An *Iron*ical View.

A "Puzzled Stranger" writes to the *Times* complaining that he cannot find his way about London at night, on account of the difficulty of reading the names of streets by the pale and ineffectual glimmer of gas-lights which, in many cases, serve but to make "darkness visible." This young man from the country suggests that the names of the streets should be painted on the lamps at street corners on the panes parallel to each street. The plan recommended by the "Puzzled Stranger" is not quite new, having been employed in New York for the last seven or eight years. In the Transatlantic city something of the kind is absolutely necessary, for New York is almost as badly lighted as London.—*Iron.*

(The same Journal, in its next issue, exhorts as follows:)

"In broad daylight it is possible for an "intelligent foreigner" to find his way about London on foot, and, if he be very patient, he may succeed in discovering the particular house of which he is in search, but at night he is almost compelled to throw himself upon the tender mercies of a cabman. We adverted last week to the miserable lighting of our streets and the impossibility of reading the names written up at street corners, but this is not the only infliction to which the hapless stranger is subjected. Many streets are undergoing the process of being numbered anew. We should be glad to know whether any intelligible idea on this important subject actuates the ruling authorities. There is only one rational mode of arranging the numbers of houses, and that is to put the odd numbers on one side and the even on the other. In some cases this principle is recognised, but in general it is set at defiance. In many streets in the process of building it has very naturally been adopted, as it is the only system which admits of the prolongation of a street without putting the numbers awry. In long streets the ridiculous custom of allowing the numbers to run up one side and down the other is productive of the greatest annoyance. The vast irregular growth of London, of course, prevents the adoption of the perfect plans adopted in the chessboard cities of the New World, such as the Philadelphia system, which assumes that each block of houses contain 100, and thus enables a perfect stranger, after the simple system has been explained to him, to find not only the street but the very house he is in quest of without the slightest difficulty. Perfection like this is unattainable in London, but the present clumsy style of numbering should be got rid of with the least possible delay."

Decline in the Price of Oil.

A new section of the Pennsylvania oil region has been tapped within the past few weeks by enterprising well-borers, and their labors have resulted in the opening of copious flowing fountains of oil. So great indeed has been the flow, that the proprietors have not been able to supply tanks and barrels fast enough to catch the liquid as it gushes from the pipes, consequently large quantities have run to waste. The new region is situated in Butler county, some distance south of Oil City, and is supposed to be quite extensive. The result of these new petroleum supplies is the overstocking of the market and the decline in the price to 80 cents and $1 per barrel, delivered on the cars near the wells. This is a condition that probably cannot long continue, and the prices will undoubtedly soon rise again. But the depression is likely to prove very disastrous to the honest and industrious oil-pumpers, who, producing from their wells 10 to 20 barrels per day, were just able to make a living for themselves and give occupation to their hard-working assistants. The number of these oil dealers is large, and many of them will doubtless be thrown into bankruptcy.

The Starr farm, near Grease City, is at the present time the most highly favored by the caprices of the petroleum fortune. One well located here has given over 1000 barrels of oil a day for several weeks, and others in the vicinity are regularly delivering 500 and 600 barrels daily. New wells are constantly being bored. The export of petroleum the present year has reached the enormous amount of 78,000,000 gallons; in fact, all the foreign markets are flooded with it at prices considerably higher than it could be laid down at these ports at the present time, consequently causing immense losses and distress to many engaged in the business.—*Manufacturer and Builder.*

Chemical Experts.

BY J. M. MERRICK, B.SC.

As every judicial decision bearing upon the relation of experts to the courts is of interest to your readers, I send you the following memorandum:

In a hearing held April 8th, in the Supreme Court of Massachusetts (the case being the Charlestown Water Board *vs.* Alexander Mosely, the suit being brought to restrain the defendant from polluting the waters of the Mystic Pond, from which Charlestown derives its supply of drinking water, by pouring into the Abajonna River the refuse of his tannery) the court, Gray, J., after receiving the testimony of S. Dana Hayes, J. M. Merrick, and Benjamin Silliman as chemical experts, refused absolutely to allow Prof. Silliman to testify upon the action of decomposing organic substances in water upon the health of persons using the water; or, in other words, refused to accept Prof. Silliman as a medical expert, although he stated that he is a doctor of medicine, and has for many years been a professor of medical chemistry.

The ruling of the court was combated by the senior counsel for the plaintiff, E. R. Hoar, but the court held firmly to its decision, and the next day stated that on careful deliberation the court felt sure the ruling was a proper one, because Prof. Silliman was not a *practising physician*, and had not *himself* made the action of decomposing vegetable and animal matters upon the health of human beings a special study.

To the illegal mind it would seem hard to find in the whole country a man better fitted to explain and elucidate the point in question than the witness so unexpectedly set aside.

LABORATORY, 59 BROAD ST., BOSTON, MASS., April 10th, 1873.—*American Chemist.*

Discovery of New Petroleum Strata.—TITUSVILLE, PA., Sept. 18.—Intense excitement prevails in the oil regions over the discovery in the lower district of a fourth sand rock, which promises to be more prolific in the production of petroleum than either of the former producing strata of the second and third.

Street Lighting in Paris.

M. Maxime du Camp, in an able article in the *Revue des Deux Mondes*, gives some interesting particulars of the street-lighting of Paris. In olden times all good citizens were commanded in moments of trouble—"which," adds the author, "rather quaintly, "were of more frequent occurrence then than in our day"—to put a light in their windows and a pail of water on the threshold of their doors. These precautions were intended to prevent fires and nocturnal attacks. The first attempt at street-lighting was made in 1558, when, by an ordinance of the Parliament of Paris, a *falot* was placed at the corner of every street, and in the case of long streets, an additional one in the middle. This instrument resembled a gibbet, having suspended from it by a chain a heavy iron bowl filled with resin and tow. The *falots* did not illuminate the city very brilliantly, but they at any rate displayed a ruddy flame, which served to "guide the wanderer's steps aright;" but the Wars of the League soon put an end to them, and for the space of a century Paris was left in utter darkness. Louis the Fourteenth, who, by the way, took for his device a rising sun, ordered Nicolas de Reynie, the founder of the city police, to put an end to this state of things, and gave him as a word of command three substantives—cleanliness, light, safety. Very little time was lost, and in 1667 the edict was published prescribing the establishment of lanterns. These were simply candles, enclosed in a glass frame, and suspended by cords at the height of the first story of the houses. Lanterns were, in 1745, succeeded by the oil-lamps called *reverbieres*, which remained in use till within the memory of many living persons.

Philippe Le Bon—the inventor of gas—met with a tragical fate. On the day of the coronation of the first Napoleon the unfortunate inventor was assassinated, it is said, in mistake for the emperor. Three years before this, in 1801, he had exhibited this wonderful discovery in public; but what is most remarkable—although he had shown the quality of light that he could produce either from coal or wood—the chief point which struck the minister of the First Consul was, that the distillation of wood produced cheap tar. To Phillipe Le Bon was therefore granted the concession of part of the forest of Rouvray for the purpose of making tar.

The widow of Le Bon endeavored to carry out the plans of her deceased husband, but on her death the patent was suffered to lapse by her family, and was taken up by a German naturalized in England, named Winsor. It was one more instance of the *sic vos non vobis*, with which the history of inventions is filled. Curiously enough the French were slow to appreciate the advantage of gas. It was not till the year 1830 that the first street in Paris, the Rue de la Paix, was lighted by gas in the teeth of a violent opposition. Every misfortune was attributed to the unpopular light. The nature of the calamity did not matter much—the death of a tree or the arrival of the cholera—it was all put down to the gas.

For some time the lighting of Paris was in the hands of several companies, but by degrees these have been fused into one great corporation, possessing ten great factories in and around the city. The Parisians, who found it so difficult to accustom themselves to the new light, are now great and increasing consumers of gas. In 1855 they consumed 53 millions, in 1865 they used 155 millions, and in 1872 no less than 196 millions of cubic yards of gas. This vast monopoly is charged heavily by the municipality of Paris, in various ingenious ways. To begin with, the company pays the city 1200,000 francs per annum for the rent of the ground occupied by its pipes, and, in addition, reimburses all costs of paving, etc. In 1879 these expenses reached 179,677 francs, and are estimated at 100,000 francs in the municipal budget for 1873. It is true that the company pays no *octroi* duty on coal, but, on the other hand, pays a fixed duty of two centimes on every cubic metre (39⅜ inches) of gas manufactured. On this account alone the company paid 2,508,953 francs in 1872, and was also obliged to pay to the city a proportion of its profits, amounting to five millions of francs. The good city of Paris thus receivek from the gas company in 1872 no less than 7,708,953 francs, or £308,358 2s. 6k. sterling. This is truly a tremendous tax upon light.

It is always curious to investigate the meaning of the word progress as used by a distinguished foreigner. M. Du Camp observes that "gas enters every day more and more into our domestic habits—before a *hundred years* are over, the smallest hut will be supplied with gas and water. This will be great progress."

Moderation is a virtue—unhappily so rare among Frenchmen, that we cannot help congratulating M. Du Camp on possessing such an ample supply. The hope that every Frenchman may have gas and water laid on in his house within *a hundred years* does not reveal a very sanguine nature. Let us hope better things of France.—*Iron*.

Petroleum vs. Coal as a Fuel.

We take from the *Philadelphia Press* the following account of a recent test of petroleum as a substitute for coal as fuel:

Petroleum has for some time past engaged the attention of some of the most scientific and skillful inventors of the age, in the developing and application of its known qualities for heat, Many mechanical devices for the purpose have been constructed, which possessed more or less merit when worked in a small way, but signally failed to accomplish the desired end when practically tested on a large scale. In response to an invitation from I. Hendricks, Esq., of Philadelphia, the inventor of a new and improved device for burning petroleum and its products, we visited the machine shops of the Philadelphia and Baltimore Central Railway Company, at Shamokin, and witnessed its operation, We found the apparatus placed in the firebox of the stationary engine used to drive the works of the shop in question (being a forty-horse power) in full operation. No special change or alteration in the furnace was made, further than the removal of the grate bars, and substituting in their place the oil vaporizer and burner. The apparatus is very simple in construction, and easily applied to heating purposes at a little cost. The principle of the device consists in the decomposition of water into its component elements, oxygen and hydrogen, and uniting the same under intense heat with the hydrocarbon vapors of petroleum, thus furnishing from water the equivalent of hydrogen (naturally deficient in oil), necessary to perfect combustion. For this purpose two walled iron cylinders are made use of, with the burner placed immediately underneath, by which novel arrangement the flame from the burner is made to superheat the steam in one and decompose both steam and oil in the other, and from hence passes to the place where the heat is required; one and the same flame doing the entire work desired, no other fuel being made use of.

The trial in its practical workings proved eminently successful in every respect. Every appliance was brought to bear upon it to break down its force that the shops could command, but a head of steam was kept up without any deviation. In every respect it was fully demonstrated to the entire satisfaction of a number of practical gentlemen present, that its adaptability for generating steam for motive power and manufacturing purposes generally, was beyond question, and that too, at about one-third less cost than coal. The advantages claimed by the use of petroleum over coal as a fuel, are less cost and labor in handling: the petroleum and oil once turned on burns until turned steam off; no cutting out of clinkers; no stoking required—no ashes, no cinders, no sparks, no smoke—less time required in getting up heat. It can be started in a few minutes, and extinguished instantly, with no danger whatever, as the tank holding the oil may be located fifty or a hundred yards away from the building. It is perfectly under control. Its freedom from sulphur produces a very superior quality of iron, when applied to puddling furnaces. These are a few of the advantages that experiments have demonstrated can be accomplished. It is also claimed that a superior article of gas can be made by this process at less than one-half the present cost, and as well as for heating houses, and for all purposes for which light and heat are required.

If one half can be accomplished that seems to have been demonstrated in the present trial, it will create a great revolution in the use of fuel, and will prove of incalculable value to the public generally.—*National Oil Journal*.

Machine-Stoking.

W. Mann, Gas Works, Dorset street, London, has taken out an English patent for apparatus for charging and discharging gas retorts.

This invention has for its object the reduction of manual labor by the substitution of machinery worked by steam or other suitable power, the different parts of the apparatus being operated upon through the intervention of pressure, or a vacuum caused by the aforesaid power, the employment of a vacuum for the purpose being new. The machine is so constructed that it can travel to and fro in front of the retorts, and certain parts are so arranged that the scoop or rake may be raised or lowered to any suitable elevation to suit the position of the retorts. The apparatus is preferred to be made in two separate and distinct machines, one for charging and the other for drawing. The apparatus for charging the scoop with coal consists of an elevator and accessories. A receptacle for coals is attached to the bottom of the machine, and in it is placed a drum, a corresponding drum being erected overhead. Around these drums two endless pitch chains carrying buckets work, the said buckets carrythe coal from the receptacle to the top of the elevator, when they are suddenly tilted, and the coals contained in them are thrown into a hopper. The novelty in this part of the apparatus is the use of an upright elevator, and the peculiar manner in which the buckets are hung and tilted.

The hopper referred to supplies coal to a horizontal case, in which the coal is drawn by a screw. When the case is filled, its bottom is opened, and the coal falls down a shoot into the scoop. In case the coal supplying screw runs too fast, means are provided for returning the surplus coal to the receptacle, or by a sliding action of the end of the case operating upon levers, the screw is stopped. Means are also provided for stopping the elevator should the hopper become surcharged. The whole of the arrangement in reference to the hopper, screw-case, and shoot is new. The scoop consists of two parts divided along its bottom, and is made to enter the retort by means of chains actuated by the engine power through the intervention of gearing, or by the application of a vacuum, for the production of which special apparatus is provided. When the scoop has attained a suitable distance in the retort, the scoop is thrown open by similar means to that just described, and the coal is distributed in a crescent or semi-circular shaped layer in the retort. The scoop is then withdrawn by the same power, and is ready to receive another charge of coal for the purpose of repeating the operation. The peculiar arrangement for moving the scoop forward and backward, and for opening the same together with the application of a vacuum for the purpose is new. The rake, bit, or head is attached to either a solid or hollow bar, which has an axial motion, and is also furnished with subordinate bits, which enable the rake to bite into the coke and do its work more effectively. When the rake bar is passed into the retort and has obtained full hold of the coke it may be withdrawn by impulsions, or by one steady pull, or a combination of both. The giving of an axial motion to the rake and the subordinate bits, as well as the adaptation of a vacuum for producing the requisite motion if found desirable, are new.

An implement something like a scoop, semi-rotative cutter, or bar shovel is also provided to assist the rake in removing the charge when found necessary. This implement is also new.—*Iron*.

Ozokerite Candles.—Ozokerite is found in beds in beds in the sandstone of Slanik, in Moldavia, in the neighborhood of mines of coal and of rock-salt; it has also been discovered in the Carpathians. The material in its crude state is brown, greenish, or yellow; it is translucent at the angles, and its fracture is resinous. It is naturally brittle, but when softened can be kneaded like wax. It blackens on exposure to the air. It becomes negatively electric on friction, and exhales then the aromatic odor of a hydrocarbon. It melts at the low temperature of 66°. Its illuminating power is such that 754 ozokerite candles give a light equal to 891 of paraffine, or 1,150 of wax.—*Chem. News*.

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—Ed.

A Good Suggestion.

Troy, N. Y., August 29, 1873.

Mr. Editor: We would suggest as a very important object to be accomplished—and to that end, to be discussed—a uniform system of threads in valves and fire hydrants. Now, there are in valves all sorts of threads on the stems; square, V, half V, and what is vastly worse, some turn to the right and others to the left; or some are what is called right-handed and others left, making endless confusion.

The nozzles of fire hydrants of given sizes vary materially. In case of a large fire in a town, it is often necessary to call for assistance from neighboring places, but very often none can be given, because the connections of the two fire departments, though nominally alike in size, vary in the number of threads to the inch. The result may be the loss of unnumbered thousands.

If you can aid to effect a reform in this direction, you will be public benefactors. H. G. L.

An Explanation Needed.

Portland, Me., September 26, 1873.

Mr. Editor: Can you, or any of your readers, give a satisfactory explanation of the accumulation of water in the top of the dry meter, outside the "measuring chamber." I have made repeated inquiries of persons connected with meter manufactories, but can get no satisfactory solution of the question.

The proprietors of one of the largest meter manufactories in the country writes, in response to an inquiry, as follows? "We can only say that it is not uncommon to find water in tops. We have taken out as much as four buckets full from a fifty light meter, and have called gas engineer's attention to this matter several times. They only account for it by condensation and that is our opinion. We have seen more water in meters this year than ever before, owing, we think, to the extreme cold of last winter."

How much gas it would require to yield so much water, and what become of the "dry gas," if the meter case was perfectly tight, are questions intimately connected with the first. G.

Casting the Standard Meters.

The International Metric Commission, which met in Paris in October last, decided that each of the States represented should be supplied with a standard meter made from iridiated platinum, and that the manufacture of all the bars should take place at the same time, and from one melting of the alloy. Before proceeding with this extensive and delicate operation, the French section of the commission, to which the work is entrusted, have recently caused to be made two type meters in order to test the processes which will be hereafter employed in forming the standards. M Deville having succeeded in obtaining iridiated platinum in a perfectly pure state, the fusion and casting of the types recently took place in his laboratory, in presence of the President of the Republic and many other distinguished personages. Nineteen and four-fifths lbs. of platinum were, by the action of the oxyhydrogen flame, melted in 45 minutes with 2·2 lbs. of iridium, the latter, it may be here remarked, being by far the least fusible and hardest of the metals which accompany platinum in its natural state. The ingot was cast in a mold formed from a block of carbonate of lime, the interior surface of which was brought to the state of caustic lime, under the excessive temperature therein developed. By this means all risk of fissures within was avoided. The metal cooled in the mold, retaining its brilliant surface, after which the bar was suitably rolled and finished. The operation was a complete success, and will be repeated with the 440 lbs. of alloy necessary to compose all the standards. This will be a metallurgical process, says *Les Mondes*, far exceeding in magnitude anything of similar nature that has yet been attempted with these inalterable metals.—*Exchange.*

Manufacture of Illuminating Gas from Crude Petroleum.

The Pittsburgh *Commercial* states that the method discovered by Mr. Charles Gearing, of that city, has been put into successful practical operation at Sharpsburg, Pa., and the borough is now admirably lighted by gas made from crude petroleum oil, 8,000 feet of gas being produced from one barrel of the oil.

As the subject is one of great importance, not only to the inhabitants of our towns and cities, who need good light at a cheap price, but also to gas companies and oil producers, we will give a few details of the Gearing process, from which practical gas men may, in some degree, judge of its actual merits. To us it looks like a good improvement, worthy of the careful investigation of all who are interested in the extensive branch of industry to which it pertains.

In the simpler form of the Gearing apparatus, some seven retorts are employed in connection with one furnace. These retorts have double chambers, made by enclosing small cylinders within other cylinders of large diameter. The inner cylinders are filled with pebbles, the object of which is to provide very extensive heating surfaces. A jet of steam and air is, by means of an injector, introduced at one end of the first of the series of retorts, and then passes through the pebbles, successively into and through three other retorts, until the steam and air are thoroughly dried and heated; thence the jet goes into contact with the crude petroleum in another retort and takes up therefrom a supply of the oil vapor, thence on successively through three other retorts contained in the furnace, where the final heating takes place, thence into the gas holder. The operation is simple and continuous. The peculiar construction of the retorts is alleged to prevent loss of oil by conversion and deposit into solid carbon, the only resulting deposits in the retorts being the sand usually found in crude oil, with some other foreign matters.

A company has been formed, we understand, to put this process in operation in Titusville, Pa. We shall look with much interest for the practical results. The success of this or any other method of employing crude oil for permanent gas illumination, would create an immense demand for the article, and give relief from the depressing effects of over production under which the oil market now suffers.—*Sci. Amer.*

The Aqueducts of Rome.

By J. B Parker, C.B.

No city in the world was so well supplied with water as ancient Rome. The aqueducts traverse every part of it, and their remains are interesting, not only to the archæologist, but to the practical engineer, who would know how, in that hot and often dry country, such a boundless supply was maintained. No less than nineteen aqueducts, or streams of water running through Rome, are enumerated in the "Regionary Catalogue" of the fourth century, but only nine are mentioned by Frontinas, who had charge of them in the first century, and who has left an admirable treatise on them. Some of the later aqueducts were merely branches from the main lines.

The principal aqueducts were brought from Sabiaco, forty miles from Rome, and high in the hills. They were brought with great skill, and show very clever engineering. Where they were not tunnels they were large stone pipes; these stone pipes are each six feet high and two feet wide. They were not kept full of water, one-third of the upper part being left for air. They were brought by a very gentle descent to the city; the greater part of the way underground, but crossed the gorges on bridges sometimes 100 feet high. The later aqueducts cross the Campagna for the last part of their route, at the height of twenty feet or more above the ground, forming beautiful arcades. Of the latest and finest, there are still four or five miles of arcade remaining in Roma Vecchia. The greater part of this was destroyed in the sixteenth century to build a new aqueduct, which was constructed in the roughest manner from the old materials. The Aqua Alexandrino was choked up soon after it was built, in a singular manner, by stalactites, one of the springs used for it contained so much carbonate of lime in solution, that it speedily filled up miles of the stone pipes.

The celebrated Aqua Marcia has recently been again brought into Rome. The company which has brought this excellent cool water into Rome consisted of English capitalists, aided by the late Mr. Shepherd. The engineers found it expedient to adopt the old plan of the time of the empire. For the first ten miles of its route the water is carried in stone pipes, and on arches where necessary, just as in the old manner. But, after descending the hill at Tivoli, it is carried in large iron pipes to avoid the detour the old aqueducts were compelled to take

The Anio Novus is part of the river Anio itself. Great engineering works were made in the time of Claudius and Nero. A great wall, twelve feet thick, being thrown across the river, forming a cascade. Beneath the surface was the entrance to the aqueduct, so that, unless the pipe was full, no water flowed over the wall. This marvellous and successful piece of engineering continued in use for centuries. It was destroyed in the fourteenth century by an ignorant monk, who pierced the foundation to relieve a temporary flood.

The opinion commonly entertained that the ancient Romans were ignorant of the fact that water will always rise to its level in closed vessels is entirely a popular delusion. At every half mile of the aqueducts, on their course to Rome, each aqueduct forms an angle, to break the force of the water, and at that angle a great reservoir is made, with a filtering place at one end. This consists of four vaulted chambers, two above and two below. The water enters into the top of the first upper chamber, it then falls through a hole in the vault into the first lower chamber, then passes through small holes in the intermediate wall into the second lower chamber, then rises through a hole in the vault into the second upper chamber, whence it follows its course at the same level as before. Each filtering bed is therefore built on the principle that water finds its own level. The large stone pipes were used because neither lead nor terra cotta would withstand the force of the water. At the present time, the iron pipes of the new company burst so frequently that they fear having to relay the whole extent

Burning Coal Mines.

We mentioned in our late June number, page 128, that there is a burning coal mine near Mauch Chunk, which has been on fire since 1832, and that all attempts to extinguish it have failed. We will add to this that the only thing left that could be done, has now been done—the coal deposit of this mine has been disconnected from the rest of the coal measures by digging and filling the spaces with stone, rock and earth. It will now burn a few years longer till it has reached the limit set to it, when it will extinguish. In the meantime the ground is falling in in proportion as the fire advances. The places which most recently sank down, emit smoke and vapor; the ground is hot and is never covered with snow in winter, while the eastern extremity, where the fire commenced, is now totally cooled down, but the rocks are baked, and show every shade of color, like unequally burned bricks. They have left their stratified posit on and are reclining in every conceivable way, in consequence of the irregular sinking resulting after the coal below was burned.

There are a few other places about this locality where the coal is on fire. In one of them measures are now being taken to drown the fire out by setting that mine under water, for which purpose subterraneous dams are being built to confine the water to the burning mine.

It is not impossible that in geological periods, some coal deposits may have been destroyed in the same way, resulting in a falling in of the upper strata, by the destruction of the coal deposits upon which they rested. Certain it is at least that the coal has disappeared from some localities, esdecially where they

were exposed to the atmosphere. So the summits of the Catskill Mountains consist of the very same geological formation as underlies the coal. If they were higher than they are, they would have coal on top, and such coal is of course almost in the same danger of being destroyed by fire as are the mountain forests by which yearly we suffer such sad losses; and it is not unlikely that this has been the fate of the coal if this existed in that locality, as is probable.—*Manf. and Builder.*

Cheap Domestic Motors.

Through the efforts of M. Fontaine and others, this subject of cheap domestic motors continues to attract a great deal of attention in France. Fontaine's gas engine, of one-man power, has received the gold medal at the Lyons exposition, and a silver medal was given to the constructors; but the general introduction of this motor is checked by legal prohibitions. The type of engine worked out by M. Fontaine has neither safety valve, gauge cocks, nor water gauge; and the administration, consulting old ordinances, imposes the necessity of providing his engine with all the accessories and surety apparatus generally employed. These complications greatly increase the cost of the machine, and restrict the number of its applications. M. Fontaine observes, however, that his domestic motor constitutes, in spite of this inconvenience, the most advantageous solution of the question, as well from the consideration of first cost as from cost of maintenance. He compares this engine to electric, hydraulic, and spring motors, and proves the advantages of simplicity and economy which the Fontaine engine possesses over all others. Calculations made by the inventor estimate the daily cost of gas, for a one man engine, from 1·12 franc to 1·35 franc, according to the price of gas.—*Iron Age.*

Invention for Economizing Fuel and Preventing Smoke.

Mr. Joseph Knox, proprietor of the Highfield Steel Works, has lately patented an invention for economizing fuel and preventing smoke, which consists of bringing together two atmospheric pressures which meet in the fire and create a perfect combustion. The first, an upward pressure, is obtained by means of a fan or blower, and which enters the ash box underneath the fire bars. The front of the ash box and the furnace door are made perfectly air tight, and hence the blast from the fan is forced through the bars of the grate, and causes the fire to burn, thus giving a more intense heat than is obtained in the ordinary way. A back draught is produced by placing a damper on the top or in any part of the chimney; thus cutting off the ordinary draught caused by long chimneys. A pipe is put into the chimney just below the damper, and extending downward for some sixteen or twenty feet. The pipe is open at the bottom, thus allowing egress for the carbonic acid gas, which is the residuum of combustion. The upward draught from the fan must always be kept a little in excess of the back draught from the pipe, so that it will carry off the carbonic acid gas as soon as liberated. If the back draught were strongest the carbonic acid would be kept back, and would extinguish the fire.

The patent is applicable to steam boiler and other furnaces. A boiler fitted up on the new principle has been at work at the Highfield Steel Works for a fortnight, and has been carefully tested as to the quantity of fuel used as compared with the old principle. It has been first worked a day on the latter principle, the fuel weighed, and the engine carefully worked a at a given pressure. It was found that 13 cwt. of coal were consumed per day. Then, it has been tested on the new principle at exactly the same pressure and doing the same work, and has only consumed 8 cwt. of fuel in the day—thus showing a saving of 40 per cent. It is true the best was not made of the fuel under the old principle; but the patentee confidently anticipates that under any circumstances a saving of fuel of from 25 to 30 per cent. will be effected and all smoke prevented. When the fan is not working and the two pressures are not brought together, smoke is generated as usual: but immediately the fan is started the smoke that is in the flues is blown out in a few seconds, and no more is generated. It is necessary to feed the fire by means of a hopper, so as to do away with the necessity of opening the door. In the erection of new works in which this principle is adopted, there is no necessity whatever for the construction of tall chimneys. The invention has been examined by a board of experts and pronounced upon favorably.—*Iron Age.*

Cinders.—M. Chary has recently made experiments with the view of utilising cinders which have dropped through the grate. He suggests passing condensed air over red hot cinders, whereby carbonic oxide is formed, which gives a flame of several feet in length, well adapted for boiler heating. The greatest difficulty lay in the ultimate removal of the refuse cinder. From his short experience in this direction, he calculates that two kilometers of cinders, sorted by hand, give a heating effect equal to that obtained by one kilometre of coal. It has been argued that the mode of separation was of the greatest practical importance. The wet process was not to be recommended, on account of the extensive drying grounds required, and the fact that after all the pieces had to be used in a damp state. A current of air has been suggested as an agent for separating, or as it were winnowing the bits. Another authority on the subject states that the amount of incombustible matter in the cinder amounts to 10·5 per cent. by volume, or 26·7 per cent. by weight.—*Iron.*

Colt's Firearms Company has just received an order for 30,000 pistols. Smith and Wesson have commenced work upon 20,000 Russian pistols, and will make about 150 daily.

PRICES OF FOREIGN AND DOMESTIC GAS COALS.

[Reported Expressly for this Journal.]

OCTOBER 2, 1873.

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English Cannel.			
Ince Hall	$17 00	@	18 00
Kirkless Hall	16 50	@	17 00
English Caking Coals.			
Newcastle Gas	$12 00	@	00 00
Liverpool caking	11 50	@	12 00
British Province Coals.			
International—At Sydney, $2 50 in gold			— —
Block House—At Mines, $2 50, Gold			0 00
Little Glace Bay—At Mines, 2 50 Gold			— —
Pennsylvania Coals.			
Penn Gas Coal—At Amboy	$8 50	@	0 00
Westmoreland—At Amboy	8 50	@	0 00
(In New York both the above coals	$9 10)		
Shafton	9 10	@	0 00
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West Virginia Coals.			
MurphyRun	$7 50	@	8 75
Despard—At Baltimore	6 30	@	0 00
West Fairmont	8 60	@	0 00
American Gas Coal	8 50	@	0 00
Fairmont	8 50	@	0 00
Newburgh Orrel	8 50	@	0 00
Pinnickinick	8 50	@	8 75
Cloverhill of Virginia	6 75	@	7 00
McKenzie Compound Mixture			— —
American Cannel Coals.			
Peytona of West Virginia	$15 50	@	00 00
Darlington of Pennsylvania			— —
American Cannel	$14 00	@	00 00
Asphalts.			
Albertite of New Brunswick	$— 00	@	— 06
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Trinidad Bitumen	— —	@	14,50

WANTED—A SITUATION AS SUPERINTENDENT of a Gas Works. Is thoroughly acquainted with the manufacture of gas in all its branches. Reference as to capability, etc., can be had from his late employer. Address, CARROL COLLINS, 310 Monroe Street, Peoria, Ill. 342-1t

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SITUATION WANTED by a young man who understands the repairing of Gas Meters, erecting Street Lamps, Gas Fitting, and how to take the statement of Meters. He is capable of taking charge of a small Gas Works. Has had six years experience in the business. Addres, J. T. WHEELER, Indianapolis, Ind., care of JOHNSON, BROS.

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THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY.

Publishing Office, No 42 Pine Street.

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EDITOR---PROF. HENRY WURTZ.
Sec'y of the Gas-Light Association of the U.S.
Editor's Private Office, 12 Hudson Terrace, Hoboken, N. J.
(Immediately fronting the Ferry Houses.)

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☞ All communications to be addressed to "THE EDITOR, No. 42 Pine Street, Room 18, New York.

THURSDAY, OCTOBER 2, 1873.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS*, or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

☞ NEWS AGENCY.—The American News Company, 11 and 121 Nassau street, New York agents for this Journal. News dealers will please send orders to them.

NOTICE.

☞ *All Collections for Advertisements, Subscriptions, etc., are made directly from this Office. We have Agents to solicit the same, but they are not authorized to Receipt for Money.*

TO OUR SUBSCRIBERS AND PATRONS.

In making remittances for subscriptions, always procure a draft on New York, or a POST OFFICE MONEY ORDER, if possible. Where neither of these can be procured, send the money, but always in a REGISTERED LETTER. The registration fee has been reduced to fifteen cents, and the registration system has been found by the postal authorities to be virtually an absolute protection against losses by mail. ALL Postmasters are obliged to register letters whenever requested to do so.

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TO THE GAS-FRATERNITY.

THE GAS-LIGHT ASSOCIATION.

This is the last opportunity that will be enjoyed by the Secretary of the Association, before the meeting of the 15th instant, for communication with the Fraternity.

The Secretary believes that, considering the numerous difficulties he has labored under, the chief one being the absence of the President from the country, which left all to his own responsibility, he may congratulate himself upon his summers work, and still holds to his opinion that there will be represented at the first meeting of the Association not far from one hundred Companies. The roll of those which have, up to this present writing, either signed the Constitution or paid the Initiation Fee is about 50, and at least half as many more have signified in correspondence their intention to join, and to be represented. To give an idea of the *wide-spread* interest in this movement, it may be stated that on this roll are from—

Massachusetts	1 Co.
Connecticut	1 "
New York	14 Co.'s
New Jersey	2 "
Pennsylvania	5 "
Ohio	5 "
Michigan	4 "
Illinois	1 "
Wisconsin	1 "
Iowa	1 "
Delaware	1 "
Virginia	2 "
District of Columbia	1 "
North Carolina	1 "
Kentucky	1 "
Tennessee	1 "
Georgia	1 "
Florida	1 "
Louisiana	1 "
Texas	1 "
California	1 "

New York it seems takes the lead so far. Other States must hurry up. The Gas Interests of the whole nation must be represented and protected in every quarter alike. The Secretary's conscience fully acquits him of any lack of diligence in carrying out the instructions conveyed to him. He has even done this to the detriment of his own private and professional business. The results cannot be expected to appear all at once. With regard to letters of complaint received from certain parties that the Constitution has not been put before the general public, he would say that he received no authorization, felt no authority, and saw no reason for doing this. He was directed to "send it to all the Gas-Light Companies throughout the United States." This by resolution of Mr. Steele. This he believes he has done, so far as possible.

It remains to call especial attention of the Fraternity to the following circulars. The arrangements therein made have received the personal sanction of President Roome, as well as of Mr. Price, of Cleveland, 2d Vice President, whom the writer, during a recent western tour, had the good fortune to meet.

CIRCULAR TO AMERICAN GAS-LIGHT COMPANIES.

Gentlemen coming as delegates to the meeting of the Gas-Light Association of the United States on the 15th of October, are requested to call at the Astor House, at or after 9 A. M. of the 14th, where a room will be provided and a book for the entry of their names and companies, and information given of the place where the meeting is to convene. HENRY WURTZ, Sec.

CIRCULAR.

To the Executive Committee of the Gas-Light Association of the United States.

The Executive Committee is constituted as follows:

Chas. Roome, of New York, President of the Association.
P. E. Demill, of Detroit, 1st Vice President.
W. H. Price, of Cleveland, 2nd Vice President.
Thos. R. Brown, of Phila., 3d " "
O. G. Steele, of Buffalo.
Jas. Howe, of Brooklyn.
Geo. McIlhenny, of Washington.
E. W. Leavenworth, of Syracuse.
Chas. C. Mowton, of New York.

By order of the President the above nine gentlemen are respectfully invited, and *earnestly urged*, to convene at the *present* office of the Association, at the residence of the Secretary, No. 12 Hudson Terrace, Hoboken, N. J., on Monday, the 13th this month (October), at 10 A. M., or as soon thereafter as possible, to hold one or more meetings for the discussion and decision, in advance, of many questions of the utmost importance regarding the organization, government, and general welfare of the Association.

All members of the Association who have been consulted regarding this preliminary meeting consider it of the highest importance that these preliminary meetings of the Executive Committee should be full.

As a few *samples* of the points which should be considered by the Executive Committee, the Secretary would submit the following:

Credentials and Voting Powers of Delegates.
Modes of Assessment.
Preservation of Records.
Books and Office for Secretary.
Mode of Publication of Proceedings.
Legal Incorporation, etc., etc.
Critical examination of the Constitution makes manifest many other points.

HENRY WURTZ,
Secretary.

[N. B. The residence of the Secretary immediately faces the ferry houses in Hoboken.]

[Advertisement.]

A Description of the New "Boulevard" and Street Lamp, which has Been Adopted by the City of New York.

These lamps, which may now be seen in use in all the Parks, Squares, Boulevards, and leading Avenues of New York, and in many cities throughout the world, *are made in three styles.* The *plain* style, *which is without reflectors*, affords more light than any other lamp in use, and is supplied at a very low price. The *street* style has, in addition to the above, *one reflector*, which is placed upon the top of the iron lamp frame surrounding the globe, and increases the amount of light for a considerable distance about the post. The "*Boulevard*" style has, in addition to the above, a *second reflector* of a convex form, placed above the glass upon the chimney, which is secured to the top of the glass. This style of lamp has been found by actual test, during the space of nearly two years they have been used in New York, to give fully one-half more light than any other in use. The glass of these lamps is made an elongated globular form, twelve (12) inches in diameter, by twenty inches in height. The peculiarity of its form, and great thickness, enables it to withstand very rough usage.

☞ *The improvement recently made for placing street or other names in the most conspicuous manner upon the lamps is highly approved.*

"A new improvement which seems to meet the wants of the people—the addition of a band of ground

glass raised upon the globe of the Boulevard street lamps, above the light, gives a prominent place to the name of the street. The letters, three inches in height, in round-faced characters, stand out boldly, and when it is done throughout all the streets, New York will be the best lighted and best street-lamp directed city in the Union."—*N. Y. Com. Advertiser.*

"An improvement has been made in the lettering of the Bartlett lamp. By the new method the glass itself is lettered just above the supporting ring. Being transparent, this affords a clear and beautiful legend."—*N. Y. Tribune, May* 16.

J. W. BARTLETT,
Patentee and Manufacturer, 569 B'way, N Y.

A NEW INVENTION FOR LIGHTING STREETS.

FROM REPORT OF]
THE FRANKLIN INSTITUTE.

PHILADELPHIA, Jan. 20, 1873.

The Committee on Science and the Arts, to whom was referred for examination

Dyott's Patent Street Lamp.

Report having given it a careful amination, that they deem it to other Street Lamps in the followin particulars:

It has a *double* semitransparent top with an intervening air space, which keeps the top cool, and prevents that breakage of glass so prevalent in other Street Lamps, and by the arrangement of its drafts more complete combustion is produced, and a greater amount of light is obtained from a given quantity of gas. Its semitransparent Reflector transmits sufficient light to illuminate the upper portion of surrounding buildings, and reflects the light where it is wanted, around and below. It also shelters the heated glass globe from rain, hail, and snow, and prevents breakage. It is peculiarly well adapted to display Street Names. Its arrangement and facilities for cleaning are excellent. It possesses decided advantages over other Street Lamps, and its tasteful design, in connection with ts moderate cost and the durability of its construction, commend it as an article for general street and other uses.

By order of the Committee.
D. S. HOLMAN, Actuary.

THE EXPOSITION AND INDUSTRIAL FAIR OF KINGS COUNTY, N. Y.

FIRST DIPLOMA Awarded to M. B. DYOTT for Street Lamps of superior excellence, at the annual exhibition at the City of Brooklyn, N. Y., 1872.

ATLANTIC CITY, August [illegible] 1872.

We the undersigned, Mayor and Members of Council of Atlantic City, N. J., having had twenty of Dyott's Patent Street Lanterns in use for some months, take pleasure in saying they have given entire satisfaction. Having no doors they are not subject to exposure, are durable, beautiful and easily cleaned—are the best we have seen or used, and have no doubt they will be generally adopted, when their advantages become known to Gas Companies and City Governments.

(Signed by the Mayor and every Member of the City Council.)

We the undersigned citizens of Atlantic City, having Dyott's Patent Street Lamp at our Hotels, fully concur in the recommendation of the same by our Mayor and City Council hereto annexed.

WILLIAM G. BARTLETT
ALBERT BROTHERS,
BARCLAY S. SMITH,
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One set Condensers, 14 inch Pipes with 6 in. internal Pipe.
One Exhauster with Compensator, Governor, Valves, Pass, by and] Connecting Pipes, 8 inches diameter, made by Smith & Sayre, in use but a short time; capacity 12,000 feet per hour; has delivered 16,000 with ease; amply sufficient to deliver 350,000 feet a day.
Four Purifiers, 10 by 16 feet, 5 sets trays, 8 inch connections, all in perfect order except the covers.
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Two sets Hoisting Gear for covers.
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Imperial 8vo. 950 pp. and over 200 Illustrations.

Now in Press, and to be issued November, 1873.

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JAMES R. SMEDBERG,

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This work comprises the essence of the *London Journal of Gas-Lighting*, from February 10th, 1849, to December 31st, 1868, with the monographs read before the British and North British Associations of Gas Managers, between the latter date and November 1st, 1873. There are also added essays written expressly for the "Synopsis," upon DISTRIBUTION, by two distinguished engineers; and a Zincograph of the latest form of that valuable contribution to the Art, **the Sabbaton Multitubular Condenser.**

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The whole is, by permission, dedicated to CHAS. ROOME, Esq., as Head of American Gas-Lighting.

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The compiler and his publishing agent will jointly guarantee the return of all remittances upon the 1st of February, 1874, in default of publication by that date.

It is hoped that every manufacturer will be represented by an illustrated card.

Advertisements cannot be received later than November 1st. They will be inserted in the order of date of their reception.

All communications relating to the SYNOPSIS OF BRITISH GAS LIGHTING, must be addressed

JAMES R. SMEDBERG,
Consulting Engineer, Etc., San Francisco, Cal., U. S.

This work is endorsed by officers of the following American Gas Companies:

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OR

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By E. S. Cathels, C. E.,

Ass. Inst. C. E., England
Member Brit. Asso. Gas Managers, Etc.,
Montreal, Canada.

339-6t

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341 tf Sup't Troy Gas-Light Co., N. Y.

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Gas Engineers can fully appreciate their advantages, reducing as they will, the first cost of new Works, and increasing the capacity of old ones, with little outlay, or any interruption of manufacture, and resulting in a large future saving of working expenses, with an increase of product.

Estimates of new construction or alterations furnished.

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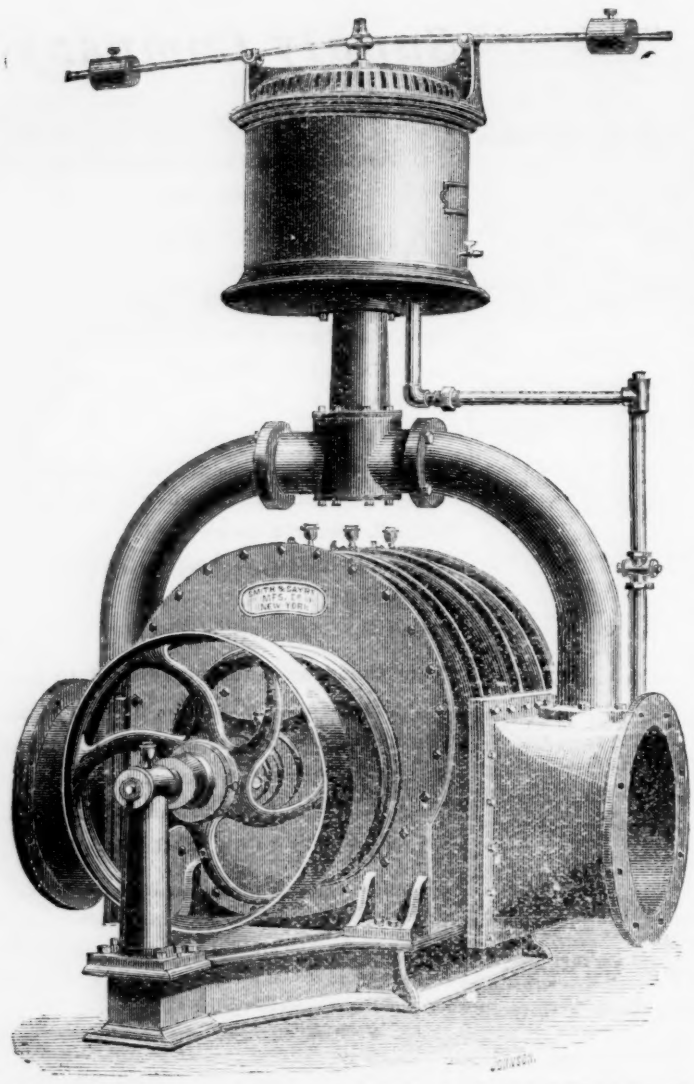
AMERICAN GAS WORKS CONSTRUCTION AND *Supply Company,*

No 61 Broadway, N. Y.

SMITH & SAYRE MANUFACTURING COMPANY.

The Mackenzie Patent Gas Exhauster

And Patent Compensator.



They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

We are also sole proprietors and manufacturers of the

MACKENZIE PATENT BLOWER, PATENT CUPOLA AND SMELTING FURNACE.

The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary Fan. The Cupolas are manufactured in sizes to melt from 1 to 20 tons per hour, will save one quarter of the time required by the old style Cupola, and 33 per cent fuel. Address

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OFFICE, 96 LIBERTY STREET, New York.

AMERICAN

GAS SCREEN MAN'F'G COMPANY.

TO GAS-LIGHT COMPANIES.

Your attention is respectfully called to the GAS SCREEN now being manufactured by the American Gas Screen Manufacturing Company, under the patents granted to E. DUFFEE, and are pleased to submit the following points of their excellence and superiority over all other screens now in use.

The Screen is made with an oak frame, interlaced with split rattan, drawn through holes at regular intervals in the Frame and cross-pieces, the edges of the frame being grooved prevent abrasion.

The advantages of the screen are:

1st. The large purifying surface, the construction of the Screen giving over three-fourths of the surface for the gas to penetrate the lime.

2d. On account of the free passage of the gas through the creen the pressure is reduced, thereby preventing the accumulating of carbon on the retorts.

The saving of lime and labor, as the Screens are not e to clog, and are easily cleaned.

Their cheapness and simplicity of construction.

5th. Their DURABILITY—they can be used longer than any her now used.

Testimonials.

PROVIDENCE, RHODE ISLAND, March 21st, 1872

E. DUFFEE, Esq., Agent, etc.

Dear Sir: The Trays manufactured by you for our West Station were put in use in September last, and have *given perfect satisfaction.*

The frames are well put together, and I see no reason why ey will not last for a long time. The *very large amount of n space* in these Trays gives the gas an easy passage, and brings it into contact with the lime much better than when the space is so contracted, as is the case in most of the other Trays in use.

The pressure thrown upon the retorts by contracted passages is very great, and were gauges used more frequently than they now are in many gas-works, this facat of having *open Trays* would become more apparent to mangers of gas works. The digerence in pressure at this station in passing the gas through your purifiers, is two-tenths (2-10) inches.

The amount of gas purified, per bushel of lime used to this date, is six thousand five hundred and fifty six (6,556) cubic feet.

Respectfully yours,
JAMES H. ARMINGTON, Supt.

BOSTON GAS-LIGHT CO., Dec. 1871.

Dear Sir: In answer to your inquiry how we like your Patent Tray for dry gas purifiers, I take pleasure in saying we have used them exclusive of all others, for the last three years, and think them far ahead of any yet offered. The surface being nearly three times that of any other Tray, and their lightness and durability perfectly satisfactory.

Yours respectfully,
A. M. GILES.

EDWARD DUFFEE, Esq.

EAST BOSTON, JUNE 15, 1871.

Gentlemen: We have used your Screens some five years. They give perfect satisfaction.

I consider them *by far the best Screen* for Dry Lime Purifiers I have seen. Yours truly, A. M. NORTON, Supt.

CHELSEA, May 1, 1871.

Mr. E. DUFFEE.

We are using your Purifying Trays, and find them to be the *best of any* that I have used, and will *purify more gas with less pressure* than any tray that I know. I can fully recommend them, after four years trial, to any Gas Superintendent with perfect safety, as the *cheapest and best Tray made.*

Yours truly, JOHN ANDREW, Sup't.

DORCHESTER, March 3. 1870.

Mr. E. DUFFEE.

Dear Sir: We have had your Gas Trays in constant use for almost one year and six months and find them superior to any others we have ever used, both in point of economy and efficiency. Truly yours, W. B. BROOKS,
Agent Dorchester Gas-Light Co.

JAMAICA PLAINS, MASS., June 21, 1871.

EDWARD DUFFEE, ESQ.

Dear Sir; The Trays ordered by this company three years ago, are getting somewhat worn. I wish to say here that I consider your Trays to be superior to any yet invented, therefore please make us another set at the price named, to be like the sample shown in every way, and oblige Yours truly
JAMES F. ROGERS,
Sup't Jamaica Plains Gas-Light Co.

BROOKLINE, June 11, 1871.

E. DUFFEE, ESQ.

Dear Sir: You will please make a set of Gas Trays for this company as soon as convenient, at price named. In regard to the merits of the Tray, after having them in constant use for over two years, I will say that I consider them *superior to any Tray* manufactured in this country. Respectfully yours,
H. A. ALLYN,
Sup't Brookline Gas-Light Co.

BANGOR, August 2, 1870.

EDWARD DUFFEE, ESQ.

Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays, I take pleasure in saying that they have been in use over two years, and have given perfect satisfaction and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted. Respectfully yours,
W. H. PERRY, Sup't.

OFFICE OF THE SPRINGFIELD GAS-LIGHT CO.
SPRINGFIELD, MASS., Oct. 10, 1871.

Mr. WARD,
President Hartford Gas-Light Co.

Dear Sir: I have been using Gas Screens made by the American Gas Screen Company, for nearly a year, and find them superior in every way to the wooden Screens made and formerly used by the Springfield Gas-Light Co. I can purify more gas with the same quantity of lime, there being more surface to the Screens; and I consider them more durable. and recommend them to your consideration.

Yours with great respect,
GEORGE DWIGHT.

ROXBURY, June 14, 1872.

EDW. DUFFEE, ESQ.

Dear Sir: In answer to your inquiry regarding your Patent Gas Screens, I am happy to be able to say, that after nearly three years constant use we are perfectly satisfied with them being able to purify over fifty pet cent. more gas with them, than with any other Screen we have used.

Yours respectfully,
THOMAS J. PISHOU

OFFICE DETROIT GAS-LIGHT CO.,
DETROIT, MICH., April 22, 1872.

AMERICAN GAS SCREEN MANUFACTURING CO., HAVERHILL.

Gentlemen: The Screens bought of you work far better than any we have ever used. As a proof, we have with the same quantity of lime purified *twenty per cent.* more gas with your Screens than with any others, and the work well done. The workmen are also better pleased with them—they being light and handy to work. They also relieve the pressure very much upon the retorts, and I cheerfully give yau my experience.

Yours truly,
P. E. DEMILL, Secretary.

We give a list of some Gas-Light Companies using them.

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Address **A. P. JAQUES, Treas.,**
Amer. Gas Screen Man'f'g Co., Haverhill, Mass

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Manufacture of Coal Gas,

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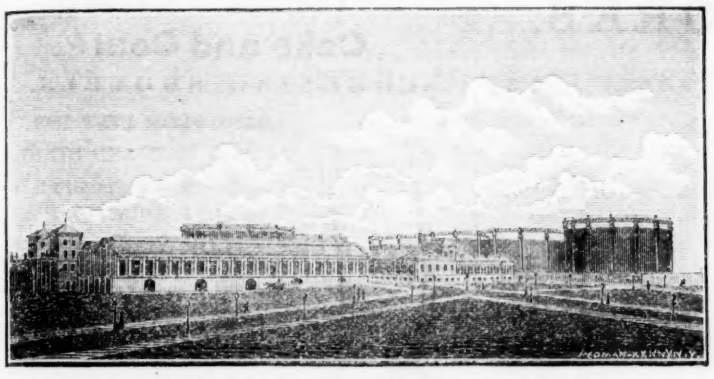
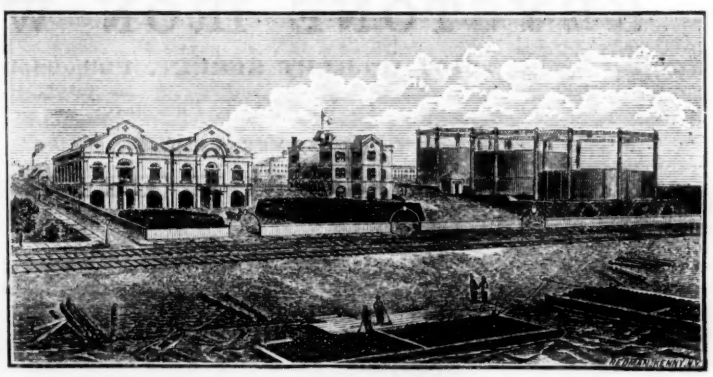
Orders for fitting up Valves of any desired form or patent, *subject to the generality of the Gibson claim*, and also for SUPPLIES and MATERIALS of every description required for the use of Gas Light Companies promptly attended to by

W. H. GRENELLE, Special Agent.

REFERENCE.—RICHARD MERRIFIELD, Esq., late Vice President MANHATTAN GAS-LIGHT COMPANY.



CINCINNATI GAS WORKS, ERECTED 1871-72-73.—WM. FARMER, ENG.



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Exhausters for Gas and Foul Lime Ventilation,
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Blowers for Forges, Foundries, &c.
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W. W. SCARBOROUGH, President Cincinnati Gas-Light Company, Cincinnati, Ohio.
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Has purified, per bushel, on a single test, 10,000 feet of Westmoreland Gas. With revivification lasts indefinitely. Surpasses in POWER and ECONOMY all known materials. Saves largely in FIRST COST, SPACE, LABOR, SUPERINTENDENCE, and all current expenses. Will purify *easily* sulphurous gas, wholly *unmanageable by lime.* Takes out *all the ammonia.* Now operating in the following Gas Works: Harlem, New York (21st street); Port Morris; Hunter's Point; East New York Worcester, Lynn and Cambridge, Mass.; Lewiston, Maine; St, Albans, Vt.; Pawtucket, R. I.; Meriden, Ct.; and being introduced in many other places.

Cost 70 cents per bushel. One bushel for each square foot of Purifier sufficient. Rights to use for life of Patents, for daily makes of gas in thousands; under 25,000 $200; under 50,000, $400; under 100,000, $500; $250 additional for each additional 50,000 per day.

For further information and instructions, apply to
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☞ Immediate arrangements are urged, as the demand for e prepared composition is increasing *so rapidly* that delays supply may occur.

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All sizes from 3 to 30 inch cast vertically in 12½ feet lengths

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From the Sterling Colliery.

We are now prepared to place in the market, through our agents as below, a regular and unlimited supply of this valuable Cannel, for gas purposes. The analysis made in 1871 by Prof. WURTZ, Editor of this Journal, at the Laboratories of the NEW YORK GAS-LIGHT COMPANY, gave 47½ per cent of Volatile Matter and 45 bushels to the ton of a fair quality of coke. The yield of gas was at the rate of 9,500 feet per ton of about 27 candle power. It is not highly sulphurous, can be purified by Lime, and the ash from the coke does not clinker. The above test has been fully substantiated as correct, and can confidently recommend trial of the coal.

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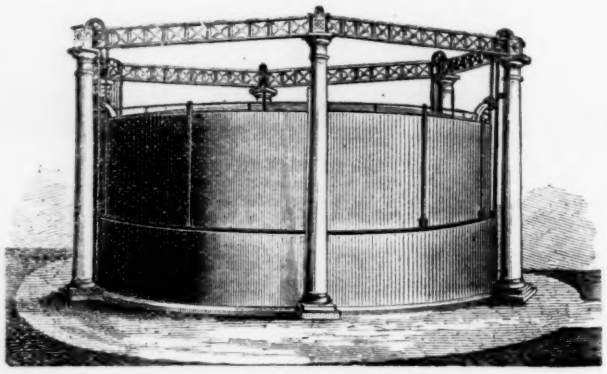

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O. R. BUTLER,
96 Maiden Lane, N. Y.

OFFICE OF

THE GAS-LIGHT CO. OF AMERICA,

C. K. GARRISON, President.
E. W. McGINNIS, Secretary and Treasurer.
JOHN P. KENNEDY, Chief Engineer.
LEONARD D. GALE, Consulting Chemist.

GENTLEMEN: We beg leave to inform you, that we have purchased the Patent process for making ILLUMINATING GAS from PETROLEUM and its products, known as the

Gale and Rand Patents,

and we are now prepared to treat with you for the use of said process by your Company.

We are also prepared to contract for putting said process into successful operation in your works, furnishing all the necessary plans, materials, and workmen for that purpose.

We do not deem it necessary to enter upon a detailed description, here, of the processes above referred to, deeming it sufficient to state, to secure your interest and investigation, that they have been in successful operation, for months, in a number of Gas-Light Works in the United States, and are now being introduced in the works of the Mutual Gas-Light Company, of New York City; the Citizens' Gas-Light Company, of Brooklyn; the New Orleans, San Francisco, and very many other Gas-Light Companies throughout the country.

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BRASS GAS BURNERS.

The *best* Gas Burners in the World for Street Lamps; also for Portable Gas Machines, to order.

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37-3m

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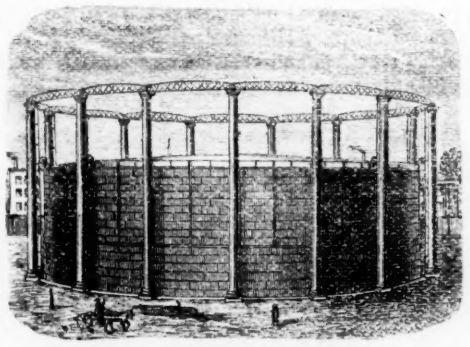

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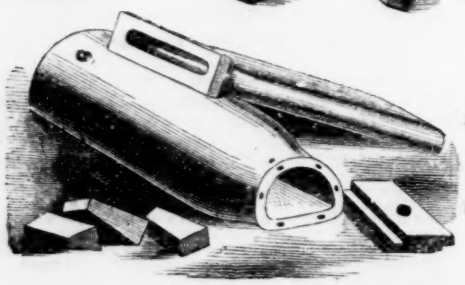

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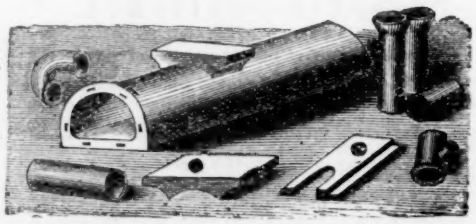

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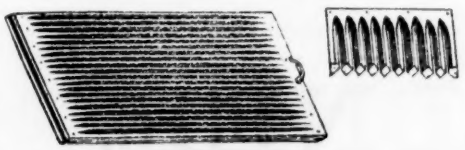

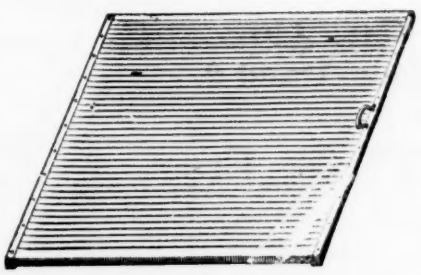

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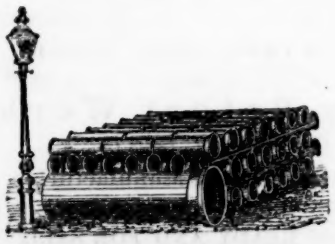

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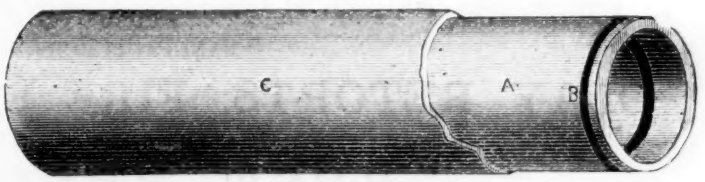

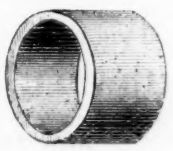

FIG. 2.

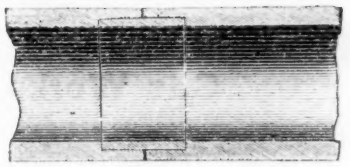

FIG. 3.

A—Cylinder of Wood. B—Band of Iron. C—Coating of Hydranlic or Asphaltum Cement.

FIG. 2.—Thimble for Connection. FIG. 3—Horizontal Section and Connection.

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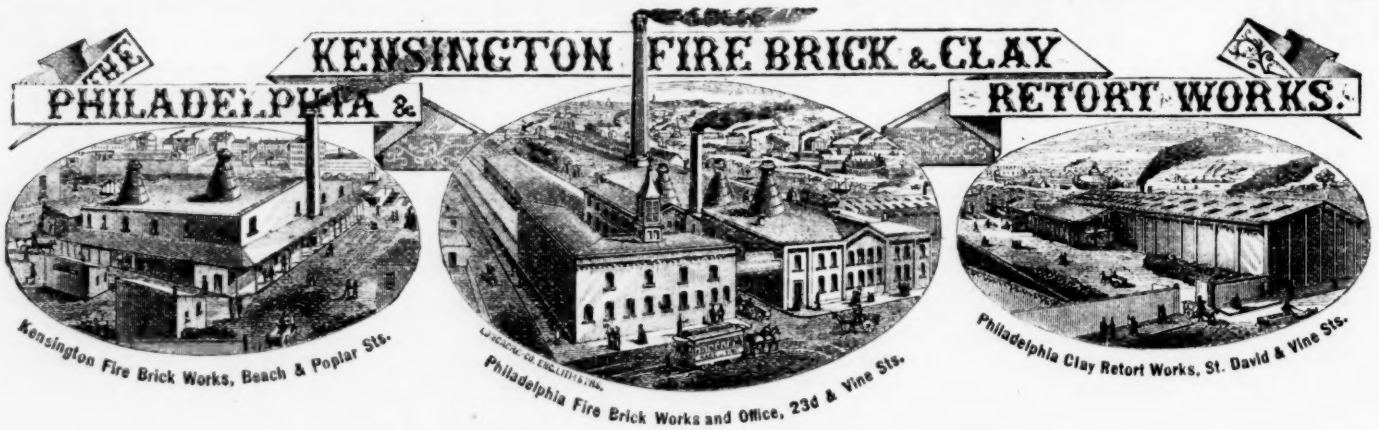
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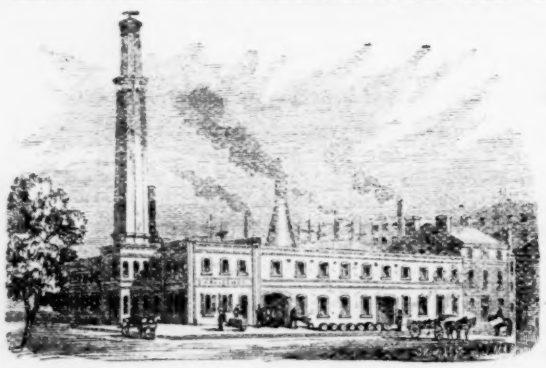

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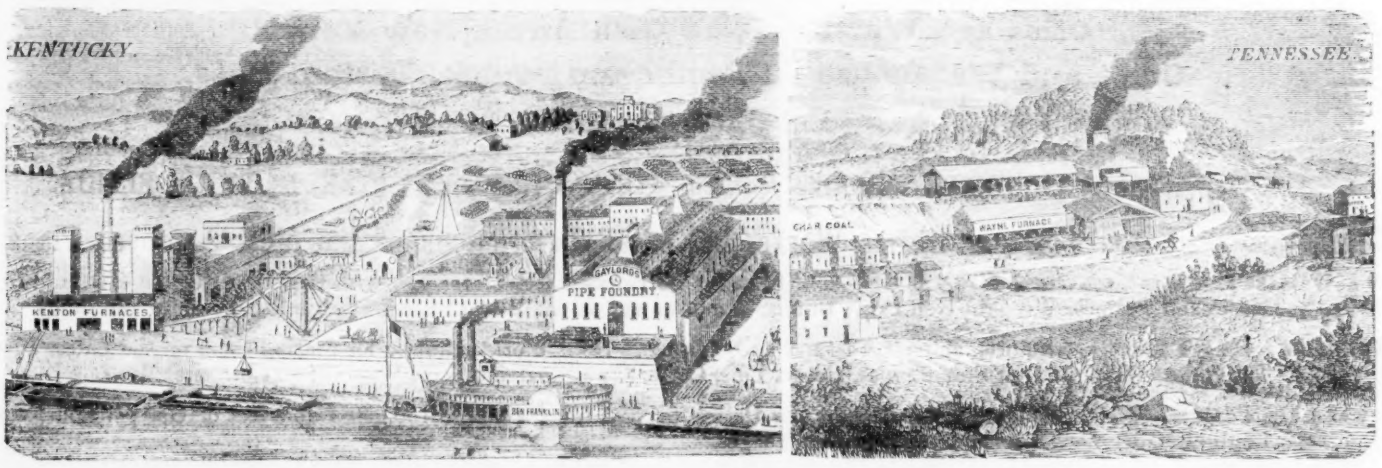

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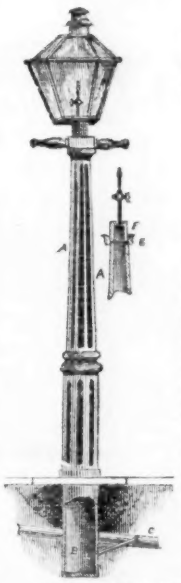

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FOR GAS WORKS MACHINERY, ADDRESS OFFICE, FIFTH AND TASKER STREETS, PHILADELPHIA.

Manufacturers and Builders of Gas Works, &c., of all Descriptions, of the Most Approved Plans.

WROUGHT IRON ROOF FRAMES.—For Slate, or Corrugated Iron Coverings, with Cast Iron Cornice Gutter. Iron Doors and Frames, Wrought Iron Pivot Blinds, Windows and all kinds of Castings and Smith Work for Buildings.

BENCH CASTINGS.—Retorts, and all Castings and Wrought Iron Work required for Setting them on the Latest Plan. Tar Gates, Wrought Iron Stand Pipes, Retort Lids, Cotter Bars, Coal and Coke Wagons, and Stokers' Tools.

EXHAUSTERS.—Exhausters and Compensators, By-Passes to pass from 4,000 to 150,000 Cubic feet of Gas per hour, with Engines, Governors, Pressure and Vacuum Guages.

SCRUBBERS.—Single or Multitubular Scrubbers, with Self-Acting Pumps for Ammonia Water.

WASHERS.—Cataract and Single and Multitubular Spray Washers.

CONDENSERS.—Single and Multitubular Air and Water Condensers.

PURIFIERS.—For Purifying from 1,000 to 2,000,000 cubic feet capacity daily, with either wet or dry Lime, or Oxide of Iron, and with either Ash Rivetted or Wrought or Cast Iron Lime Sieves.

CARRIAGES.—Movable Lifting Carriages for Purifiers, arranged either for Floor or Overhead use.

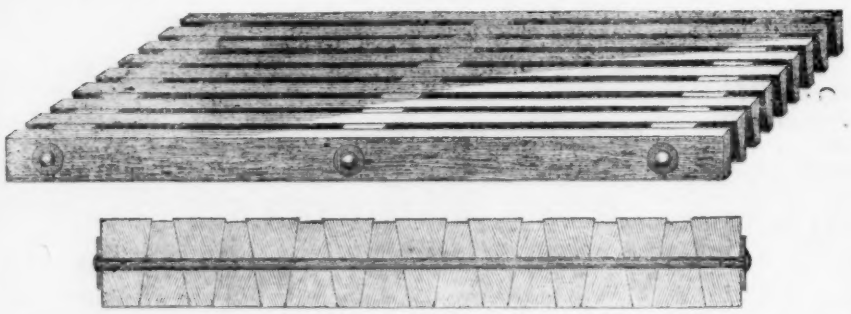
METERS.—Square and Round Meters of any capacity.

GAS HOLDERS.—Single Lift and Telescopic Gasholders, with Cast or Wrought Iron Suspension Frames.

GAS GOVERNORS.—Station Governors, with Regulating and Indicating Columns for Inlet and Outlet Pipes, also Dry Governors with Flexible Diaphragms for Underground Pipes.

STOP VALVES.—Double Faced Stop Valves for Gas or Water, from three inches to forty-eight inches diameter. These Valves are proved on both sides, with a heavy Water Pressure, Flange and Bell Pipes, Fittings and Drips of all descriptions. Steam Boilers and Hot Water Apparatus for Heating Building, and Gas Holder Tanks. Lamp Posts and Lanterns.

P. Munzinger's Patent Ash Lime Trays.



In use at the following Gas-Light Companies:

Pittsburg Gas Company, Pa.
Peoples Gas Company, Baltimore.
Lowell Gas-Light Company, Mass.
Lynn Gas-Light Company, Mass.
Albany Gas-Light Company, N. Y.
Schenectady Gas-Light Company, N. Y.
Utica Gas-Light Comwany, N. Y.
Jersey City Gas Company, N. J.
St. Paul Gas-Light Company, Minn.
Cumberland Gas-Light Company, Md.
Hartford City Gas-Light Company, Conn.
Richmond Gas Company, Va.
McKeesport Gas Company, Pa.
Middletown Gas Company, Pa.
East Newark Gas-Light Company, N. J.
Binghampton Gas Company, N. J.
Zanesville Gas Company, Ohio.

New Orleans Gas Company, La.
Salem Gas-Light Company, Mass.
New Britain Gas-Light Company, Conn.
Rahway Gas-Light Company, N. J.
Trenton Gas-Light Company, N. J.
Elmira Gas Company, New York.
Erie Gas Company, Pa.
Columbus Gas-Light Company, Ohio.
Westchester Gas-Light Company, N. Y.
Santa Cruz Gas Company, Cal.
Lawrence Gas-Light Company, Kansas.
Salem Gas Company, N. J.
Indiana Gas-Light Company, Pa.
Peoria Gas Company, Ill.
Montclair Gas Company, N. J.
Williamsport Gas Company, Pa.
Wooster Gas-Light Company, Ohio.

Augusta Gas-Light Company, Ga.
Huntsville Gas Company, Ga.
Chattanooga Gas Company Tenn.
Murfreesboro Gas Company, Tenn.
Hagerstown Gas-Light Company, Md.
Hanover Gas Company, Pa.
Easton Gas Company, Pa.
Uniontown Gas-Light Company, Pa.
Coatesville Gas-Light Company, Pa.
Houston, Gas Company, Texas.
Wilkesbarre Gas Company, La.
Middletown Gas Company, New York.
Washington Gas-Light Company, Pa.
Princeton Gas-Light Company, N. J.
Newark Gas Company, Ohio.
Pontiac Gas-Light Company, Mich.
And numerous other Companies.